

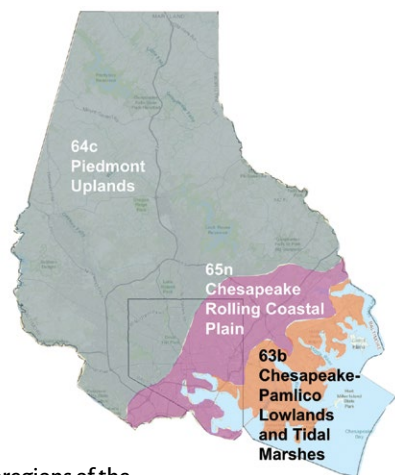
Ecoregions: A Hierarchy of Uniqueness

By ArcheWild®

The concept of the ecoregion has been around for decades but has only recently become recognized as an important tool for those engaged in restoration and rewilding efforts. This article discusses what ecoregions are, why they are important, and how we can use the concept of ecoregions at home.

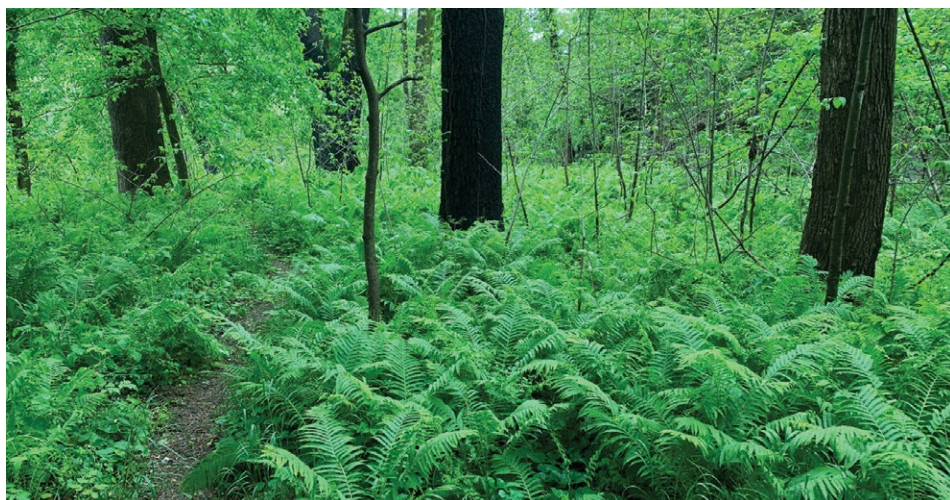
What are they?

In 1987, geographer James M. Omernik coined the term “ecoregions” and created the first maps displaying ecoregions for the US Environmental Protection Agency (EPA). These ecological regions are based on geology, landforms, soils, vegetation, climate, land use, wildlife, and hydrology. Importantly, the EPA notes, “The relative importance of each characteristic varies from one ecological region to another.” The differences between ecoregions are sometimes expressed in terms of the unique vegetation systems they support.



Ecoregions of the Eastern Shore. Map by M. Brownlee

Ecoregions are defined in levels, going from the most general (Level I) to the most specific (Level IV). Fifteen Level I ecoregions occur in North America with familiar names like North American Deserts, Great Plains, and Eastern Temperate Forests, where Maryland lies. Originally, Omernik only defined Levels I, II, and III,



Ostrich Ferns on an ancient alluvial bench at Plummers Island. Photo by Rod Simmons.

but because land managers needed more specific information relevant to planting projects, he led an effort to further subdivide the ecoregion framework. This resulted in the publication of Level IV Ecoregion maps in the early 2000s depicting 967 distinct ecoregions in the lower 48 states. This article is focused on the applicability and use of Level IV Ecoregions that were released in the early 2000s. You can read more about, and access an interactive map of Maryland's thirteen (13) Level IV Ecoregions at bplant.org/region/1364.

Ecoregions in the context of native plants

Ecoregions are key to understanding which native plants grow where and why. They help explain why many of the plant species growing in western Maryland are different from those growing on Maryland's Eastern Shore (see map). Ecoregions are geographical areas that typically support ecologically distinct and genetically unique sets of plants, often referred to as plant assemblages or plant communities (e.g., forests, meadows, swamps, or shrublands). A native plant or a set of native plants that calls one ecoregion home might be completely absent from another. In other words, not every Maryland native plant species is

native everywhere across the state.

For example, a species that is attuned to the ecological conditions present at Finzel's Swamp, north of Frostburg, will likely struggle if transplanted to a site on the leeward side of Assateague, MD, and vice versa. Likewise, if you have a beach house on Wallops Island, perusing a list of plants considered native to Maryland is of little to no use to you. Instead, you will want to see a list of species considered native to your ecoregion, which would be the Virginian Barrier Islands and Coastal Marshes.

Do ecoregions really matter that much?

Mostly. Each ecoregion is a unique amalgam of environmental factors, and crossing the boundary between two ecoregions might well transport you from one plant world to another.

But the differences between ecoregions are more foundational than the plant differences themselves. In fact, ecoregions are not necessarily defined by the species growing within them at all, but may instead be delineated by other ecological conditions such as the local rocks, water patterns, landforms, and soils, as well as the land use history. The native plants present in an ecoregion are a result of the coevolution of the physical conditions and living beings, resulting in



Accession code label on a crop of shrubs uniquely identifies the source of the seed. Photo by M. Brownlee



Monarda didyma growing at elevation often have greater mildew resistance than those growing in coves. Photo by M. Brownlee

Examples of propagation nurseries with ecoregion coding capabilities:

Greenbelt Native Plant Center (NY/NJ)

Nasami Farm (MA/VT/CT)

ArcheWild® Native Nurseries (PA/MD/WV)

Earth Sangha (VA)

the plants that are present being perfectly suited to live there and to support other life in the ecosystem. But there are even more distinctions within ecoregions, because each site has a unique history and unique physical, chemical, and hydrological traits, local plant populations may develop with unique genetic traits. The locally adapted, genetically distinct populations are called local ecotypes.

While some species show little to no such local differentiation, many, if not most plants studied in this context do. For example, scouring rush (*Equisetum hyemale*) shows no significant genetic differences anywhere in the world. On the other hand, Hart's tongue fern (*Asplenium scolopendrium*) and red spruce (*Picea rubens*) have many local ecotypes with clearly established and significantly different genetics even within one relatively small place.

Unpublished research suggests that each population of large-flowered trillium (*Trillium grandiflorum*) is genetically distinct and that butterfly milkweed (*Asclepias tuberosa* ssp. *tuberosa*) populations are genetically distinct every 50-75 miles, broadly synonymous with the ecoregions on the east coast. These findings, if confirmed, have significant ramifications for forest and meadow restoration projects, respectively. Why use seeds or plants that originated somewhere else, given that their chance of survival is less than seeds and plants from local ecotypes?

Aside from planting success, it is also considered important to use local ecotype plants in landscaping and restoration

work to preserve the genetic diversity of a species. Genetic diversity can enable a species' survival by providing options for coping with stress, such as habitat reduction and climate change. When we transplant a non-local species into a new region, not only may it fail to flourish, but if it does grow and spread, it may dominate the genetics of a locally unique population and diminish the genetic bank, an effect called outbreeding depression.

Purple coneflowers, *Echinacea purpurea*, widely available in the nursery trade, offer us an opportunity to see how this works in the real world. The species can be found naturally on thin soils in forest clearings in Wisconsin all the way down to the cedar glades of Missouri. Dry, thin, gravelly, and sandy soils in areas with low humidity, low winter rainfall, and minimal predation are its home. How would this species perform in Maryland, in our schists or the wet clays of our valleys or the humid sands of the peninsula? Probably not very well, because the plant's genetics evolved over countless generations to survive over there, and not here. Consider—we've been planting purple coneflower into our gardens and parks for so long that it should be a roadside weed by now. But it isn't. That's likely because the ecoregions of Maryland are incompatible with purple coneflower in the long term. So calling it a "native" in a Maryland context is incorrect. Purple coneflower is not native here and cannot play a significant role in healing our local ecosystems. Sure, it's possible to keep it alive at home with lots of tending, but that's gardening and cannot be scaled up across our communities and certainly

not across the state.

The prevailing philosophy on the smart use of natives is that plants originating from within a single ecoregion, regardless of the state or county, tend to be genetically attuned to, compatible with, and suitable for use anywhere within that same ecoregion. Although this is generally accepted amongst ecologists and botanists, it doesn't always lead to successful planting because, of course, each location is unique. In the absence of detailed genetic testing for each species in every ecoregion in which it occurs, there is no way to know definitively whether or not a plant grown from a nonlocal source will thrive at your site. Instead, the current best practice amongst professionals is to: 1. Use native plants grown from seed produced in documented ecoregion-specific founder plots (cultivated plantings that host a specific, documented genetic strain of a native plant) or from seed collected from wild populations by licensed collectors; <https://on.doi.gov/41FH3ZI>; 2. Growers and nursery outlets declare the ecoregion origin of their plants; and 3. Let the purchaser decide whether the plants are appropriate for their site.

How do nurseries identify the ecoregion origin of their plants?

There are a few organizations that can accurately declare and track the ecoregion origin of the plants that they grow. Ecoregion designations (e.g., 64c) are applied by a practicing ecologist or staff botanist at the time that seeds are

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Hierarchy of Locality

<i>Andropogon gerardii</i>	Undeclared origin means the seed could have originated from any state in the US and could be a blend of genetics from across the continent.
<i>Andropogon gerardii</i> , MD ecotype.	State origins provide some assurances that the seed is not from Kansas or North Dakota.
<i>Andropogon gerardii</i> , MD Coastal Plain ecotype	An ecosystem origin is preferred even if an ecoregion is not specified. In this case, the description allows the purchaser to infer the seed originated in ecoregion 63f Delmarva Uplands. Ecoregion coding would be preferred, however.

collected. An ecologist or botanist can usually determine the origin of plants based on ecological conditions, the morphology of the plants themselves, and the level of disturbance that a site has experienced in the last 30 years, which is about the time horizon over which people have been using native plants at scale. They also use specialized software (such as SeedSource™) for automatic ecoregion encoding and accession code creation (see image on page 5) for tracking plants’ origins once they’ve been categorized.

While local ecotypes are the gold standard in supporting wildlife and planting success, it can be difficult for the home gardener to navigate—which is where nurseries with ecoregion coding can be a big help [see the list of nurseries on Page 5]. The next best thing to ecoregion coding is using native “straight species” plants from a nearby area. [see the “Hierarchy of Locality” table above] Cultivars of native plants are to be used with caution and should not be used in locations where wild plants of the same species might be nearby. It is a journey to learn about local ecotype plants, but the rewards are many. We encourage you to continue learning which species are native to your ecoregion and how to use them appropriately. The benefits of choosing plants and seeds from a nursery that declares the ecoregion source are significant—to your planting success and to wildlife.

REFERENCES

ourworldindata.org/land-use
livingplanet.panda.org/en-US/
www.alleghefront.org/doug-tallamy-your-lawn-is-an-ecological-deadzone-the-case-for-replacing-it-with-native-plants/